Symmetricom 5087B Wideband Distribution Amplifier

Operations and Maintenance Manual

Part Number 05087-13402

Revision E

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Symmetricom®

Notices

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www.symmetricom.com

support@symmetricom.com

Phone:

Worldwide (Main Number)
1-408-428-7907

USA toll-free 1-888-367-7966
(1-888-FOR-SYMM)

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Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Safety Requirements

- Do not attempt to install or operate this equipment if you have not first acquired proper training.
- Ensure that all cables are properly connected. The power cord must be easy to remove from the back.
- Verify that input line voltage and current capacity are within specifications before turning on the unit.
- Do not place power supply cords or other cables on top of unit or against heatsinks.
- Operating and maintenance personnel must receive proper training before installing or maintaining electrical equipment.

Symbols

These symbols (icons) appear throughout the manual as well as on the unit itself.

Symbol	Definition
	On the unit, this symbol means: Caution - Refer to User Manual. This symbol identifies a hazard. The label next to the symbol indicates how serious the hazard is. **Danger** indicates an imminent hazard. If not avoided, the hazard will cause death or serious injury. **Warning** indicates a potential hazard. If not avoided, the hazard can cause death, serious injury, or substantial damage to equipment. **Caution** indicates a potential hazard. If not avoided, the hazard can cause moderate injury or moderate damage to equipment.
	Hot surface.
	CE marking. This symbol attests compliance to applicable European Directives.
	Fuse.
	Signal input.
	Signal output.
	Alarm signal out.
	LAN port.
	Chassis ground.
	Earth terminal symbol: used to indicate an earth ground connection to chassis.

About This Manual

This manual tells you how to install, set up, monitor, and troubleshoot the Symmetricom 5087B.

Chapter 1, “Introduction” explains symbols that appear in the manual and on the unit as well as documentation conventions. The chapter also briefly describes the Symmetricom 5087B.

Chapter 2, “Installing and Setting Up the Symmetricom 5087B” contains important safety information and describes how to install the Symmetricom 5087B, set the gain, and assign a fixed IP address.

Chapter 3, “Monitoring the Symmetricom 5087B” describes how to monitor alarms.

Chapter 4, “Troubleshooting the Symmetricom 5087B” describes how to replace fuses and verify operational problems.

Appendix A, “Specifications” contains the detailed specifications for the Symmetricom 5087B.

Conventions

This manual uses several typographical conventions to help explain how to use the Symmetricom 5087B.

Table 1 Conventions

Convention	Definition
Bold	Words in **bold** show: • Buttons and icons to click • Menu options to select • Commands to type • Non-variable information displayed in response to commands
Italics	Words in *italics* show: • Names of windows and dialog boxes • Variable information displayed in response to commands
Note	This symbol means the following information is a note that gives you important information that may affect how you use the Symmetricom 5087B.

Symmetricom 5087B Overview

The Symmetricom 5087B Wideband Distribution Amplifier distributes multiple copies of a precise frequency throughout a research and development laboratory, manufacturing facility, calibration lab, or anywhere a precise frequency standard is required.

Its input accepts 1 to 10 MHz sine waves at amplitudes of 0.3 to 3.0 Vrms and uses automatic gain control to maintain the set output level when the input signal level varies. The Symmetricom 5087B produces low noise copies of the input signal on each of its 12 outputs. Output amplitude can be adjusted from 0.75 to 3 Vrms via a potentiometer screw accessible from the front panel to compensate for cable loss.

The Symmetricom 5087B uses a 2U high, 19-inch rack-mount chassis. An Ethernet port on the rear panel enables you to remotely monitor the status of the input and output signals. When the unit detects a failure, it immediately sends an alarm to the Ethernet port. The LEDs on the front panel show the status of the input signal, each of the 12 output signals, and the inputs.

Figure 1 shows the instrument's front panel, and Figure 2 shows the rear panel.

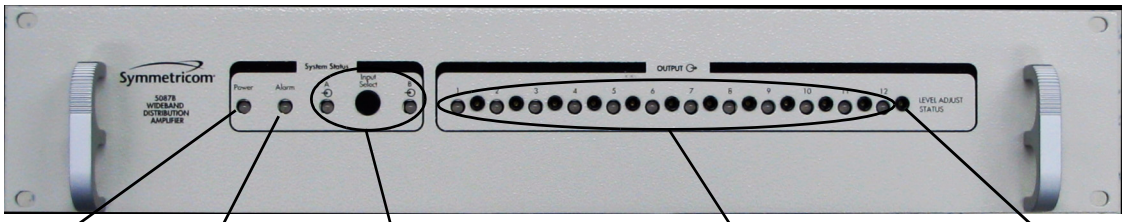

Figure 1 Front panel

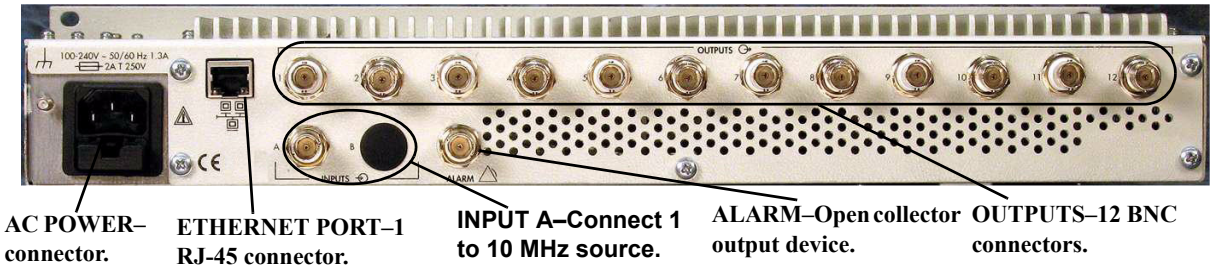

Figure 2 Rear panel

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Installing the Symmetricom 5087B

The Symmetricom 5087B ships ready for installation into a standard 19" (48.3 cm) rack.

Accessories included:

- CD-ROM documentation P/N 05087-13402)
- Power cord
- Rear brackets with attaching hardware (Replacement kit P/N 05087-67002)

Required for installation:

- North American or European IEC power cord. One or the other will be supplied with the unit.
- #1 Phillips screwdriver.
- Customer-supplied, RG223 cables with BNC connectors from source and to next devices in system.
- Customer-supplied, LAN cable for network connection (RJ-45).
- Rack mounting screws.
- Screwdriver for the rack mount screws, as needed.

Since the unit does not have a AC mains power switch, both the appliance inlet connector and the plug on the detachable power supply cord are considered to be suitable disconnect means for disconnecting the unit from the AC mains supply. If the rear of the unit is not accessible after installation in the instrument rack, you must provide a suitable external AC disconnect means for the unit.

To set up the Symmetricom 5087B

1. Unpack carefully and inspect the Symmetricom 5087B.
2. Check for physical damage.

   If you observe physical damage, immediately contact Symmetricom, Inc. and the carrier.

   We recommend saving the shipping container for submitting any necessary claims to the carrier.

3 (Optional.) Install the unit in a 19-inch rack.

   Two rack mount brackets are included with the unit to provide rear chassis support when installed in a rack. Use the three 10-32 x 0.5 screws on each side of the unit to attach the brackets.

   On short depth racks, shorten these rails as necessary to ensure that they do not cover the holes forward of the brackets' rail mounting slots. You can break off the rails after the first set of slots by bending at the point where there is a perpendicular slot and notches in the side of the bracket.

4 Plug the female end of the power cord into the male IEC-320 plug on the rear of each power supply.

5 Plug the male end of each power cord into a 100–240 VAC, 50/60 Hz power source.

   Ensure that this power supply cord is connected to a properly grounded mains receptacle.

6 Connect the input signal cables from a 1 to 10 MHz source to the INPUT A BNC connector on the rear panel.

7 Connect up to 12 cables to the OUTPUT BNC connectors on the rear panel to supply users with a copy of the input signal.

8 (Optional.) Connect a TTL input device to the ALARM BNC connector on the rear panel of the Symmetricom 5087B.

9 (Optional.) Connect a LAN cable to the Ethernet port on the rear panel of the Symmetricom 5087B.

For information about configuring the network connection, see “Assigning a Static IP Address" on page 18.

Adjusting the Output Level

You can adjust the output level to a value between 0.75 Vrms and 3 Vrms.

Required equipment:

- Oscilloscope
- Small flat-head screwdriver

To adjust the output level

1. Connect an oscilloscope to the output you want to change.
2. Using a small flat-head screwdriver, turn the potentiometer next to the LED for the output until the oscilloscope shows the output level you want.

Assigning a Static IP Address

The Symmetricom 5087B contains a Lantronix® Xport™ Ethernet to RS-232 converter, which provides the instrument's Ethernet connection.

The Symmetricom 5087B ships from the factory with a default IP address of 0.0.0.0, which enables DHCP. If the network has a DHCP server, it will assign each unit an IP address, gateway address, and subnet mask when the unit starts up.

To monitor multiple Symmetricom 5087Bs remotely through their Ethernet connections, you must assign each unit a fixed IP address. You identify which unit is the source of an alarm by its IP address. Follow the instructions in this section to assign a unit's IP address using either the Lantronix DeviceInstaller software or Telnet port 9999.

The DeviceInstaller software is available only by downloading from the Lantronix Web site. Go to: http://www.lantronix.com. For more detailed information about the DeviceInstaller software, see the *Xport User Manual.* Section 3.3 discusses several different ways that you can assign IP addresses. Chapter 4 explains how to permanently configure the IP address. You can download the *Xport User Manual* from the Lantronix® Web site as an Adobe® Acrobat® PDF file. Go to: http://www.lantronix.com

NOTE If you move the Symmetricom 5087B to a different network hub after setting up the static IP address, the host computer may not be able to make a connection. You may need to release the IP address lease on your operating system.

To assign the static IP address using the Lantronix DeviceInstaller software

1. Obtain the following network information from your system administrator for each Symmetricom 5087B you want to install:

   IP Address: _____ _____ _____ _____

   Subnet Mask: _____ _____ _____ _____

   Gateway: _____ _____ _____ _____
2. Connect a Windows® PC to the same local subnet as the Symmetricom 5087B.
3. Install and start the Lantronix® DeviceInstaller software.
4. Click the **Search Network** icon and search for XPORT devices connected to the network, then click **Save** and **Exit**.
5. Click the **IP** icon or select **Assign IP Address** on the **Tools** menu.

The hardware device number and IP address appear in the *Assign IP Address* dialog box.

6 Type the new IP address and click **OK.**

The new IP address appears in the Lantronix® DeviceInstaller window.

7 Test the IP address by pinging the instrument's Xport™ on the Lantronix Xport Installer window.

Click the **Ping** icon or select **Ping Device** on the **Tools** menu.

The *Ping Device* window should show the IP address of the instrument's Xport™ device, and it should show successful replies if the IP address has been configured correctly.

8 Exit the browser.

To assign the static IP address using Telnet

1 Telnet to the assigned address, port 9999.

2 Press **Enter** within five seconds to enter the setup mode.

3 Select Option 0.

4 Set the IP address and follow the on-screen instructions to save the setting.

5 Telnet to the new IP address, port 10001.

6 Type **I**

You do not need to type a carriage return or line feed.

The system returns **I5087B-00\r\n**, where the 00 is the hardware version, and turns on the front panel input LEDs for two seconds before returning to normal operation.

If you see these responses, you know you are communicating with the unit.

Cleaning

Clean the main chassis with a soft cloth dampened with a mild soap and water solution.

CAUTION **Do not spray or use too much liquid when cleaning the unit. Liquid can enter the unit and damage sensitive electronic components.**

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Accessing the System

You access the Symmetricom 5087B system remotely by connecting to its Command-And-Response (CNR) Port through the Ethernet connection. The CNR port (Port 10001), which uses TCP/IP, lets users input commands, displays results of the commands, and publishes alarms as they occur.

When you Telnet to the CNR port, the system does not display a prompt.

Checking System Status

You can check the system status and the model and software version remotely.

If you have connected a monitor to the open collector ALARM output connector, that device will also receive alarm information.

Checking Alarms and Input Frequency

The system can report current alarms and latched alarms.

To check system status

- Type: **S**

  You do not need to type a carriage return or line feed.

The system returns **S***abcde*,*fghij***r****n** where

- *abcde* is current status.
- *fghij* is latched alarms and changed status since the last status request.

  Both *abcde* and *fghij* are hexadecimal numbers, with each bit position representing one output. LSB (farthest right) is output 1. MSB is the input. Bits 0–15 are latched alarms. Bits 16–19 are change in status bits.

  Latched alarms remain active in the current status field and latched status field until the problem is corrected. Changed status bits are cleared upon next status request.

Example: S00001,00001

This example shows an output 1 failure that is active and occurred since the last status request.

Table 2 defines each status or alarm bit position.

Table 2 Status or alarm binary codes

Status or alarm character position	Bit position	Bit value and description
a or f	19 and 18	Remote control bits: 1:1 = Not available
	17 and 16	Front panel switch control bits: 1:1 = Not available

Table 2 Status or alarm binary codes

Status or alarm character position	Bit position	Bit value and description
b or g	15	0 = Channel A active input 1 = Channel B active input
	14	1 = Cannot lock to input B
	13	1 = Cannot lock to input A
	12	1 = Autoswitch occurred
c or h	11	1 = output 12 failed
	10	1 = output 11 failed
	9	1 = output 10 failed
	8	1 = output 9 failed
d or i	7	1 = output 8 failed
	6	1 = output 7 failed
	5	1 = output 6 failed
	4	1 = output 5 failed
e or j	3	1 = output 4 failed
	2	1 = output 3 failed
	1	1 = output 2 failed
	0	1 = output 1 failed

Understanding Alarm Output

The Symmetricom 5087B automatically publishes alarms to the CNR port as they occur.

The alarms appear in the format ALARMabcde where abcde is the summary status of the input and output signals. The format of the alarm status is identical to the “S” command response defined in Table 2 on page 23.

Example: ALARM00003

This example shows that outputs 1 and 2 have active faults.

Checking Model Number and Software Version

Both commands are case sensitive. You do not need to type a carriage return or line feed.

To check the model number

- Type: **I**

  The system returns **I5087B-00\r\n**.

To check the software version

- Type: **V**

  The system returns **V***xx***r****n** where *xx* is the software version.

  Example: V00.

3 Monitoring the Symmetricom 5087B

4
Troubleshooting the Symmetricom 5087B

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Perform all of the following procedures before returning the unit for service. For the Customer Assistance Center contact:

- Worldwide (Main Number): 1-408-428-7907
- USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia, and New Zealand: 1-408-428-7907
- USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)
- Europe, Middle East & Africa: 49 700 32886435
- www.symmetricom.com

The Symmetricom 5087B does not have any user-serviceable parts.

Replacing Fuses

If you know that a local event caused blown fuses throughout a rack, you can replace the fuses in each Symmetricom 5087B power entry module.

Required for this procedure:

- Small flat-head screwdriver
- Replacement fuse for a standard IEC 320 power entry module with fuse (5 x 20 mm, 1-amp, 250-volt fuse) (P/N 2110-0973)

To replace a fuse

1. Disconnect the power cable from the back of the Symmetricom 5087B.
2. Using a small screwdriver, open the fuse cover on the back of the Symmetricom 5087B.
3. Replace the old fuses as necessary.
4. Close the fuse cover.
5. Reconnect the power cable to the back of the Symmetricom 5087B.

Verifying Operational Problems

If the unit does not operate properly after you have verified that:

- the correct power is applied to the rear of the Symmetricom 5087B and
- the fuses are good,

return the unit to Symmetricom, Inc. for repair.

4 Troubleshooting the Symmetricom 5087B

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EC Declaration of Conformity

In accordance with EN 45014:1998

We Timing Solutions Corporation

Of 4775 Walnut Drive Suite 1B
Boulder, CO 80301
USA

declare that:

Equipment	Wideband Distribution Amplifier
Model Number	**Symmetricom 5087B**
Product Options	None

in accordance with the following Directives:

73/23/EEC	The Low Voltage Directive and its amending directives
89/336/EEC	The Electromagnetic Compatibility Directive and its amending directives

has been designed and manufactured to the following specifications:

Safety: EN61010-1: 2001
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements

EMC EN61326-1: 2001
Electrical Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
EN 55011 Class A
Radiated Emissions

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

For technical assistance, contact the factory.

Signed by:

Name: S.R. Stein
Position: President

Done at Boulder, Colorado U.S.A on 27 January 2005

Directives

The Symmetricom 5087B unit is designed to comply with the following directives and standards.

Electromagnetic Compatibility 89/336/EEC

Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive with amendments).

Safety 73/23/EEC

Council Directive on the harmonization of the laws of the Member States relating to electronic devices for use within certain voltage limits (LVD – Low Voltage Directive with amendments).

Standards

- EN 61010-1
- EN 61326-1, Class A

For more information, refer to the letter of conformance (US) or the declaration of conformity (EU) accompanying the product.

Electrical Specifications

Table 3 lists the electrical specifications for the Symmetricom 5087B.

Table 3 Electrical specifications

Item	Specification
Protection Class	Class I (Grounded Type)
Power Input	100 to 240 V~ 50/60 Hz Fluctuations not to exceed ± 10% of nominal supply voltage.
Power Consumption	STD: 70 W, 70 VA, 0.98 PF, 10 VAR
Power Inlet Type	IEC 60320 sheet C14
Power Supply Cord Set	18 AWG (0.75 mm^2 minimum)
Power Mains Fuse (2)	250V 2A T 5x20 mm (part number 2110-0973).
Signal Input	• Number: One • Impedance: 50 Ω • Amplitude: 0.3 to 3 Vrms, +2.6 to 22.6 dBm • Frequency Range: 1.0–10.0 MHz • Signal Type: Sine wave • Voltage Standing Wave Ration (VSWR): <1.5 • Damage Level: +24 dBm • Input Status Front Panel Indicator: Level detect minimum 0.3 Vrms
Connectors	• Input: 1 BNC • Output: 12 BNC • Alarm: 1 BNC • Network: RJ-45
SSB Phase Noise (5–10 MHz)	• 1 Hz: –110 dBc/Hz • 10 Hz: –123 dBc/Hz • 100 Hz: –128 dBc/Hz • 1 kHz: –144 dBc/Hz • 10 kHz+: –150 dBc/Hz
Signal Output	• Number: 12 • Amplitude: Adjustable, 0.75 to 3 Vrms, +10.5 to 22.6 dBm into 50 Ω • Frequency Range: 1.0–10.0 MHz • Signal Type: Sine wave • SWR: <1.5
Alarm Port	• 1 BNC connector • Open collector TTL output with 10 kohm pull-up to 5 VDC • Active low
Remote Interface	• Ethernet (10Base-T) • RJ-45 connector

Table 3 Electrical specifications (Continued)

Item	Specification
Harmonic Distortion (input and output ≥1 Vrms)	<–40 dBc
Spurious (input and output ≥1 Vrms)	<–80 dBc (10 Hz to 50 kHz)
Isolation	
Output to output	< -104 dBc (typical) Output isolation is measured by injecting 900 Hz signal (0.5Vpp and 20us wide) into an output port and measuring the associated phase noise spur at 900 Hz offset on adjacent output ports and input port.
Output to input	< -100dBc

Environmental Specifications

CAUTION This unit is for **INDOOR USE ONLY**. It is not sealed to prevent moisture from entering the enclosure.

- Pollution Degree 2 per EN61010-1
- Installation (Over-Voltage) Category II for transient over-voltages per EN 61010-1
- Equipment suitable for continuous operation

Table 4 lists the environmental specifications for the Symmetricom 5087B.

Table 4 Environmental specifications

Item	Temperature	Relative Humidity	Altitude
In Use	0°C to 50°C	10% to 85% (non-condensing)	4,000 meters (15,000 ft)
Storage	–62°C to 75°C	5% to 95% non-condensing)	
Transportation	–62°C to 75°C	5% to 95% non-condensing)	

Physical Specifications

Table 5 lists the physical specifications for the Symmetricom 5087B.

Table 5 Physical specifications

Item	Specification
Width	450 mm (Standard 19-inch rack mount)
Height	90 mm (Standard 2U rack)
Depth	370 mm (excluding connectors)
Weight	Weight 6.2 kg; 6.5 kg with optional 020 or 021

A Specifications

B
Glossary

\n	Line feed
\r	Carriage return
CNR	Command and Response
DHCP	Dynamic Host Configuration Protocol
ESD	electrostatic discharge
LED	light-emitting diode
LSB	least significant bit
MSB	most significant bit
PDF	portable document format
PWA	printed wiring assembly
RF	radio frequency
TTL	transistor-transistor logic

B Glossary

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